

1 1. (Once Amended) A method for communicating a data stream, the  
2 method comprising the steps of,

3 generating a sequence of data symbols from the data stream,  
4 precoding the sequence of data symbols into a sequence of  
5 precoded data symbols,

6 modulating the sequence of precoded data symbols into a  
7 continuous phase modulated signal,

8 transmitting the continuous phase modulated signal,

9 receiving the continuous phase modulated signal, and

10 filtering the continuous phase modulated signal into a  
11 sequence of filtered signals having absolute phase for indicating  
12 the sequence of data symbols.

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16 2. (Once Amended) The method of claim 1 further comprising the  
17 steps of ,

18 sampling the sequence of filtered signals into a sequence of  
19 sampled signals, and

20 demodulating the sequence of sampled signals into an estimated  
21 data stream.

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1 3. (Once Amended) The method of claim 1 wherein,

2 the generating step comprises the steps of receiving the data  
3 stream of data bits, formatting the data stream into the sequence  
4 of formatted data pulses as a sequence of data symbols within an M-  
5 ary symbol set,

6 the modulating step comprises the steps of Gaussian filtering  
7 and frequency modulating for generating the continuous phase  
8 modulated signal, the Gaussian filter step filters the precoded  
9 sequence of data symbols into pulse responses continuously  
10 accumulated over a finite memory time as a filter response, the  
11 Gaussian filtering step is defined by a bandwidth time product  
12 inversely defining the finite memory time, the frequency modulating  
13 step frequency modulates a carrier reference by the filter response  
14 by a modulation index for converting the filter response into the  
15 continuous phase modulated signal,

16 the continuous phase modulated signal is up converted from  
17 baseband during the transmitting step and is down converted to  
18 baseband during the receiving step using a local carrier, and

19 the filtering step is a matched filtering step for matched  
20 filtering of the received continuous phase modulated signal into  
21 the filtered signal, the matched filtering is matched by pulse  
22 amplitude modulation representation to the Gaussian filtering step,  
23 the filtered signal has an absolute phase at a periodic sampling  
24 time for indicating the sequence of data symbols.

1 4. (Twice Amended) The method of claim 3 wherein,

2 the modulation index is equal to a fraction selected from a  
3 group consisting of  $1/M$  and  $(1-1/M)$  fractions for the M-ary symbol  
4 set where  $M=2^k$  and k is an integer.

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7 5. (Twice Amended) A method for communicating a data stream, the  
8 method comprising the steps of,

9 generating a sequence of data symbols from the data stream by  
10 formatting the data stream into the sequence of formatted data  
11 pulses as a sequence of data symbols within a 2-ary symbol set,

12 precoding the sequence of data symbols into a sequence of  
13 precoded data symbols,

14 Gaussian filtering the precoded sequence of data symbols into  
15 pulse responses continuously accumulated over a finite memory time  
16 as a filter response, the Gaussian filtering is defined by a  
17 bandwidth time product inversely defining the finite memory time,

18 frequency modulating a carrier reference by the filter  
19 response by a modulation index for converting the filter response  
20 into a continuous phase modulated signal, and

21 matched filtering the received continuous phase modulation  
22 signal into a filtered signal, the matched filtering is matched by  
23 pulse amplitude modulation representation to the Gaussian  
24 filtering, the filtered signal has an absolute phase at a periodic  
25 sampling time for indicating the sequence of data symbols.

1 6. (Amended) The method of claim 5, wherein,

2 the sequence of data symbols has a data symbol  $d_n$  at a current  
3 symbol time  $n$  where  $n$  is an integer and has a data symbol  $d_{n-1}$  at an  
4 immediate previous symbol time  $n-1$  for precoding the data sequence  
5 into the sequence precoded data symbols having a precoded data  
6 symbol  $\alpha_n$  at the current symbol time, the precoding step is defined  
7 by  $\alpha_n = [d_n - d_{n-1} + 1]_{\text{mod}4}$ .

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9 7. (Amended) The method of claim 5, wherein,

10 the sequence of data symbols has a data symbol  $d_n$  at a current  
11 symbol time  $n$  where  $n$  is an integer and has a data symbol  $d_{n-1}$  at an  
12 immediate previous symbol time  $n-1$  for precoding the data sequence  
13 into the sequence of precoded data symbols having a precoded data  
14 symbol  $\alpha_n$  at the current symbol time for even symbol times and for  
15 odd symbol times, the precoding step is defined by  $\alpha_n = [d_n - d_{n-1}$   
16  $+ 1]_{\text{mod}4}$  for even symbol times and  $\alpha_n = -[d_n - d_{n-1} + 1]_{\text{mod}4}$  for  
17 odd symbol times.

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19 8. (Original) The method of claim 5 wherein the modulation index  
20 is  $1/2$ .

21 9. (Original) The method of claim 5 wherein the bandwidth time  
22 product is  $1/3$ .

1 10. (Original) The method of claim 5 wherein the filtering step is  
2 a matched filtering step for applying a principal Laurent function  
3 to the baseband signal so that the filtered signal comprises a  
4 principal Laurent component.

5 11. (Twice Amended) A method for communicating a data stream, the  
6 method comprising the steps of,

7 generating a sequence of data symbols from the data stream by  
8 formatting the data stream into the sequence of formatted data  
9 pulses as a sequence of data symbols within a 4-ary symbol set,

10 precoding the sequence of data symbols into a sequence of  
11 precoded data symbols,

12 Gaussian filtering the precoded sequence of data symbols into  
13 pulse responses continuously accumulated over a finite memory time  
14 as a filter response, the Gaussian filtering is defined by a  
15 bandwidth time product inversely defining the finite memory time,

16 frequency modulating a carrier reference by the filter  
17 response by a modulation index for converting the filter response  
18 into a continuous phase modulated signal,

19 matched filtering the continuous phase modulated signal into a  
20 filtered signal, the matched filtering is matched by pulse  
21 amplitude modulation representation to the Gaussian filtering, the  
22 filtered signal has an absolute phase at a periodic sampling time  
23 for indicating the sequence of data symbols, and

24 demodulating the sequence of data symbols into an estimate of  
25 the data stream.

1 12. (Original) The method of claim 11, wherein,  
2 the sequence of data symbols has a data symbol  $d_n$  at a current  
3 symbol time  $n$  and has a data symbol  $d_{n-1}$  at an immediate previous  
4 symbol time  $n-1$  for precoding the data sequence into the sequence  
5 precoded data symbols having a precoded data symbol  $\alpha_n$  at the  
6 current symbol time, the precoding step is defined by  $\alpha_n = [d_n -$   
7  $d_{n-1} + 1]_{\text{mod}8}$ .

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9 13. (Original) The method of claim 12 wherein the precoded data  
10 symbol  $\alpha_n$  is defined by the 4-ary symbol set of +1, -1, +3 and -3.

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12 14. (Original) The method of claim 12 wherein the modulation index  
13 is  $1/4$ .

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15 15. (Original) The method of claim 11, wherein,  
16 the sequence of data symbols has a data symbol  $d_n$  at a current  
17 symbol time  $n$  and has a data symbol  $d_{n-1}$  at an immediate previous  
18 symbol time  $n-1$  for precoding the data sequence into the sequence  
19 precoded data symbols having a precoded data symbol  $\alpha_n$  at the  
20 current symbol time, the precoding step is defined by  $\alpha_n = [d_n -$   
21  $d_{n-1} + 3]_{\text{mod}8}$ .

1 16. (Original) The method of claim 15 wherein the precoded data  
2 symbol  $\alpha_n$  is defined by the 4-ary symbol set of +1, -1, +3 and -3.  
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4 17. (Original) The method of claim 15 wherein the modulation index  
5 is 1/4.  
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7 18. (Amended) The method of claim 11 wherein the filtering step is  
8 a matched filtering step for applying a principal Laurent function,  
9 a third Laurent function and a twelfth Laurent function to the  
10 baseband signal so that the filtered signal comprises a principal  
11 Laurent component, a third Laurent component and a twelfth Laurent  
12 component.  
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